Topic: Difference quotient

Question: Find the difference quotient at $a = 2$?

$$f(x) = x^2$$

Answer choices:

A 4

B $4h$

C $4 + h$

D $4 - h$

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Solution: C

To calculate the difference quotient, use the formula

$$\frac{f(a+h)-f(a)}{h}$$

where a is a given x-value. Given $f(x)=x^2$ and $a=2$, start by finding $f(a+h)$.

$$f(a+h)=(a+h)^2$$

With $a=2$.

$$f(2+h)=(2+h)^2$$

$$f(2+h)=4+4h+h^2$$

Find $f(a)$.

$$f(a)=a^2$$

With $a=2$.

$$f(2)=(2)^2$$

$$f(2)=4$$

Plug these values into the difference quotient formula.

$$\frac{f(a+h)-f(a)}{h}$$

$$\frac{\left(4+4h+h^2\right)-4}{h}$$

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$$\frac{4h + h^2}{h}$$

$$\frac{h(4 + h)}{h}$$

$$4 + h$$

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Topic: Difference quotient

Question: Find the difference quotient at $a = 3$?

$$f(x) = x^2 - 3$$

Answer choices:

A $6 + h$

B $6h$

C 6

D $6 - h$

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Solution: A

To calculate the difference quotient, use the formula

$$\frac{f(a+h)-f(a)}{h}$$

where a is a given x-value. Given $f(x)=x^2-3$ and $a=3$, start by finding $f(a+h)$.

$$f(a+h)=(a+h)^2-3$$

With $a=3$.

$$f(3+h)=(3+h)^2-3$$

$$f(3+h)=9+6h+h^2-3$$

$$f(3+h)=6+6h+h^2$$

Find $f(a)$.

$$f(a)=a^2-3$$

With $a=3$.

$$f(3)=(3)^2-3$$

$$f(3)=9-3$$

$$f(3)=6$$

Plug these values into the difference quotient formula.

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$$\frac{f(a+h)-f(a)}{h}$$

$$\frac{\left(6+6h+h^2\right)-6}{h}$$

$$\frac{6h+h^2}{h}$$

$$\frac{h(6+h)}{h}$$

$$6+h$$

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Topic: Difference quotient

Question: Find the difference quotient at $a = -1$?

$$f(x) = 2 - 3x - 2x^2$$

Answer choices:

A $2 - h$

B $1 - 2h$

C $1 + 2h$

D $2 + h$

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Solution: B

To calculate the difference quotient, use the formula

$$\frac{f(a+h)-f(a)}{h}$$

where a is a given x-value. Given $f(x)=2-3x-2x^2$ and $a=-1$, start by finding $f(a+h)$.

$$f(a+h)=2-3(a+h)-2(a+h)^2$$

With $a=-1$.

$$f(-1+h)=2-3(-1+h)-2(-1+h)^2$$

$$f(-1+h)=2+3-3h-2\left(1-2h+h^2\right)$$

$$f(-1+h)=2+3-3h-2+4h-2h^2$$

$$f(-1+h)=3+h-2h^2$$

Find $f(a)$.

$$f(a)=2-3a-2a^2$$

With $a=-1$.

$$f(-1)=2-3(-1)-2(-1)^2$$

$$f(-1)=2+3-2$$

$$f(-1)=3$$

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Plug these values into the difference quotient formula.

$$\frac{f(a+h)-f(a)}{h}$$

$$\frac{\left(3+h-2h^2\right)-3}{h}$$

$$\frac{h-2h^2}{h}$$

$$\frac{h(1-2h)}{h}$$

$$1-2h$$

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